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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/558,150

11/21/2005

Amir Mortazawi

RUN-112-B

2144

48980

7590

02/21/2008

YOUNG & BASILE, P.C.

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TROY, MI 48084

EXAMINER

LEE, BENNY T

ART UNIT

PAPER NUMBER

2817

NOTIFICATION DATE

DELIVERY MODE

02/21/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/558,150	<b>Applicant(s)</b> MORTAZAWI ET AL.	
	<b>Examiner</b> Benny Lee	<b>Art Unit</b> 2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-9,11-16; 17-19,21-25,27-32 is/are rejected.
- 7) ☒ Claim(s) 4,10; 20,26; is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

The disclosure is objected to because of the following informalities: Page 2, line 2, note that “which attempt to the known problem” is vague in meaning and needs clarification. Page 3, line 8, note that --are-- should be inserted after “array” for grammatical clarity. Page 5, 6<sup>th</sup> line from the bottom, should “MEMES” correctly be --MEMS--?; third line from bottom, note that “use” should be rewritten as --using-- for grammatical clarity. Page 8, lines 6, 7, note that parameters (G, B) recited in the expressions thereat should be strictly defined (i.e. in words). Page 11, 8<sup>th</sup> line from bottom, should the reference to “Fig. 1” correctly reference --Fig. 2-- as to be commensurate with the subsequent description?; 5<sup>th</sup> & 6<sup>th</sup> lines from bottom, note that --L<sub>2</sub>-- should be inserted after “2<sup>nd</sup> inductor” and --L<sub>1</sub>-- should be inserted after “1<sup>st</sup> inductor”, respectively for consistency with the labeling in drawing Fig. 2. Page 12, line 18, note that it is unclear whether the reference to “Fig. 1” would be appropriate for the subsequent description. Clarification is needed. Page 14, lines 5-7, note that reference to “the left (part/side)” & “the right (part/side)” are respectively vague in meaning and need clarification. Pages 15, 16, note that in the paragraph bridging these pages, the text in the third line of that paragraph is not discernible and thus it is suggested that this paragraph be rewritten for completeness of description. Page 19, in equation (17), note that parameters (C, G<sub>C</sub>) need to be strictly defined for clarity of description. Page 22, line 4, note that reference to “cross-pol” is vague in meaning and needs clarification. Appropriate correction is required.

The disclosure is objected to because of the following informalities: Note that in the description of the circuits depicted in Figs. 1, 2, 3, 10, 13, 14, 15, 21, all reference labels which are unique to a particular drawing figure should be corresponding described in the specification for clarity of description. As noted earlier by applicants’, any reference label appearing in a

particular drawing figure and which has already been described relative to an earlier drawing figure need not be further described. Note that respect to the graphs depicted in Figs. 4, 5, 6, 8, 10, 12, 16, 17, 18, 20, 23, 24, 25, further elaboration of important aspects or features depicted by the curves in the respective graphs should be provided for clarity of description. Appropriate correction is required.

The use of the trademark "RT/duroid" (e.g. page 10, line 16; page 20, last line) has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

The drawings are objected to because of the following: In Fig. 1, note that -- $l_2$ -- & --2G-jB-- need to be provided such as to be commensurate with the specification description thereof; In Figs. 5, 9, 11, note that the figure number for these drawing figures are missing and need to be provided; In Figs. 7, 9, 22, note that the "photographs" depicted herein are of such poor quality as to render features therein indiscernible; In Fig. 13, note that reference labels -- $l_2$ --, --2(G-jB)-- & --3(G+jB)-- need to be provided such as to be commensurate with the specification description thereof.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the switched fixed capacitor or the switching transmission line (e.g. claims 10, 26) respectively, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The specification needs to provide a corresponding description of continuous or discrete tuning (e.g. claims 8, 24), the solid-state varactor transistor (e.g. claims 9, 25) the switched fixed capacitor or the switching transmission line (e.g. claims 10, 26).

Claims 11-14; 19, 27-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 11, 27, note that it is unclear which one of the plural “first tuning element”, the plural “second tuning element” & the plural “antenna” is intended by the respective claim recitation.

In claim 19, note that reference to “the signal” lacks strict antecedent basis in claim 17, from which this claim directly depends.

The following claims have been found to be objectionable for reasons set forth below:

In claims 1, 17, note that “an antenna” should be rephrased as --a respective antenna-- for an appropriate characterization; note that “a second tunable element” should be rephrased as --a respective second tunable element-- for an appropriate characterization.

In claims 3, 19, note that “the amplitude” should be rephrased as --a respective amplitude-- and note that --respective-- should precede “phase” for appropriate characterizations.

In claims 5, 15, 21, note that --each of-- should follow “wherein” for an appropriate characterization.

In claims 6, 16, 22, 31, 32, note that “the” should be rewritten as --each-- for an appropriate characterization.

In claims 7, 23, note that “separated by” should be rewritten as --separated from-- and --a distance-- should be inserted prior to “a half wavelength” for an appropriate characterization.

In claims 14, 30, note that “an amplifier” should be rephrased as --a respective amplifier-- for an appropriate characterization.

In claim 17, note that --respective-- should be inserted prior to “first tunable element” for an appropriate characterization.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3, 5-8, 11, 15, 16; 17-19, 21-24, 27, 31, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Sullivan et al or Kirino in view of Hopwood et al.

Sullivan et al (e.g. Fig. 1) or Kirino {e.g. Fig. 7(b)} each disclose a one dimensional phase array antenna (e.g. 10 in Sullivan et al; 801 in Kirino) comprising a plurality of series connected or cascaded phase shift elements (e.g. 15-A to 15-D in Sullivan et al; 805a, 805b, 805c in Kirino) defining a plurality of divider ports located between adjacent phase shift elements separated by a prescribed distance and to which respective antennas (e.g. antenna elements 11 in Sullivan et al; radiating patches 804a-804d in Kirino) are connected. An alternating signal source (e.g. RF source 13 in Sullivan; an un-shown signal source connected to feeding terminal 807 in Kirino) is connected to a first of the divider ports for supplying a signal to the phase array antenna through the series connected phase shift elements. Note that as the signal applied by the source propagates through the series connected phase shift elements, each phase shift element imparts a desired amount of phase shift (e.g. phase shift  $\Theta$  in Sullivan et al; phase shift  $\Phi$  in Kirino) as to provide a successive phase difference to the propagating signal at each dividing port such that the signal is radiated by the corresponding antenna with the different amount of phase shift. However, the phase array antenna of either Sullivan et al or Kirino differs from the

claimed invention since the phase shift elements do not explicitly disclose first series tunable elements and second tunable elements parallel connected to a respective antenna.

Hopwood et al discloses, with respect to Fig. 6, a phase shifter configuration comprising a plurality of series connected or cascaded phase shift elements. Note that each individual phase shift element in the series connection further comprises two series connected varactors (e.g. 72, 74) and a parallel or “shunt” connected varactor (76), where the two inductors are considered “tunable” by virtue of being designed to a different inductive reactance and where the varactor is considered tunable by the application of control voltage (69) to change the capacitance (e.g. either continuously or discretely by virtue of the type of control voltage 69) of the varactor as depicted in the general description of Fig. 5. Moreover, it should be noted that such series connected inductors, by virtue of the designed inductive reactance, would necessarily provide an impedance inversion from one end to an inductor to the other end of the inductor, as known to those of ordinary skill in the art.

Accordingly, it would have been obvious in view of the references, taken as a whole, to have realized the series connection of phase shift elements in either phase array antenna of Sullivan et al or Kirino to have been realized by a series connected phase shift configuration as taught by Fig. 6 of Hopwood et al. Such a modification would have been considered an obvious substitution of art recognized equivalent series connected phase shift configurations, thereby suggesting the obviousness of such a modification. It should be noted that the series connection of plural phase shift elements as taught by Hopwood et al would obviously have been compatible with the series connection of the generic phase shift elements in either Sullivan et al or Kirino, thereby further suggesting the obviousness of such a modification. It should be noted that as an



obvious consequence of using the series connected phase shift elements of Hopwood et al, such a combination would have necessarily included the respective varactors being connected in parallel with the corresponding antenna, such as to have been consistent with the teaching in either primary reference (i.e. plural antenna) as modified by Hopwood et al (i.e. parallel varactors). Moreover, as known to those of ordinary skill in the art, each of the inductors can be alternatively be realized by transmission line portions designed to a desired length (e.g. quarter wavelength corresponding to a desired inductive reactance) as an obvious design consideration. Similarly, by virtue of designing the two inductors to be quarter wavelength each, the corresponding electrical length of the equivalent transmission line would obviously have been one-half wavelength, thereby providing a half-wavelength distance between adjacent antennas through the series connected phase shift elements.

Claims 12, 13; 28, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kirino in view of Hopwood et al.

Kirino {Fig. 7(a)} discloses a multi-dimensional antenna array (801), comprising rows of antenna arrays (802) having corresponding series connected phase shift elements (e.g. 802a-802d) and corresponding antenna elements (e.g. antenna patches 804a-804m) connected in the configuration depicted in Fig. 7(b). Moreover, note that a signal source (not shown) is connected to feeding terminal (807). Furthermore, note that each row of antenna arrays is electrically connected at “corresponding” connections (i.e. at the ends of each row of antenna arrays).

Accordingly, it would likewise been obvious to have modified each row of series connected antenna arrays in Fig. 7(a) of Kirino by the series connected phase shift elements of the type taught by Hopwood et al. Such a modification would have been obvious for the same

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reason as set forth in the preceding rejection for the single series connected antenna array, thereby suggesting the obviousness of such a modification.

Claims 9; 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the above rejection as applied to claims 1, 17, respectively above, and further in view of Mantele.

The above obviousness combination of either one of the primary references and Hopwood et al discloses the claimed invention, except for the limitation that the varactors are of a specific type.

Mantele discloses at column 4, lines 17-20 that a GaAs (i.e. a semiconductor) varactor tuning diode is usable in a series connected phase shifter configuration (e.g. see Fig. 1).

Accordingly, it would have been obvious to have further modified the varactors in the above combination to have been semiconductor varactor tuning diodes of the type taught by Mantele. Such a modification would have been considered an obvious of art recognized equivalent varactors, especially since the generic nature of the varactors in the obviousness combination would have suggested that any equivalent varactor (e.g. the semiconductor varactor tuning diode of Mantele) would have been usable therewith.

Claims 4, 10; 20, 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim.

Any inquiry concerning this communication should be directed to Benny Lee at telephone number 571 272 1764.

B. Lee

**/BENNY LEE/  
PRIMARY EXAMINER  
ART UNIT 2817**